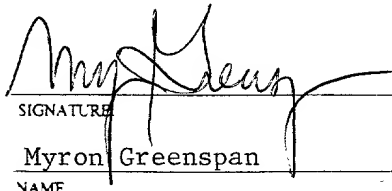


FORM PTO-1390 (REV 10-95)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER  P-9701 ISK	
<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>				U.S. APPLICATION NO. (If known, see 37 CFR 1.5)  <b>08/860763</b>	
INTERNATIONAL APPLICATION NO. PCT/RU95/000063		INTERNATIONAL FILING DATE April 11, 1995		PRIORITY DATE CLAIMED January 13, 1995	
TITLE OF INVENTION Device for Treating Planar Elements with a Plasma Jet					
APPLICANT(S) FOR DO/EO/US Tokmulin, I.; Bagriy, I.; Balats, B.; Sinyagin, O.; Virovets, A.; Shamshurin, V.; and Antropov, A.					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.					
2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.					
3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).					
4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.					
5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))					
a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).					
b. <input type="checkbox"/> has been transmitted by the International Bureau.					
c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).					
6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).					
7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))					
a. <input checked="" type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).					
b. <input type="checkbox"/> have been transmitted by the International Bureau.					
c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.					
d. <input type="checkbox"/> have not been made and will not be made.					
8. <input checked="" type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).					
9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unsigned -- signed original to follow)					
10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).					
<b>Items 11. to 16. below concern document(s) or information included:</b>					
11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.					
12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. (Assignment to follow)					
13. <input type="checkbox"/> A FIRST preliminary amendment.					
<input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.					
14. <input type="checkbox"/> A substitute specification.					
15. <input type="checkbox"/> A change of power of attorney and/or address letter.					
16. <input checked="" type="checkbox"/> Other items or information:					
(a) Declaration and Power of Attorney (unsigned -- signed original to follow);					
(b) PCT Notification of the Recording of a Change (the name change of assignee);					
(c) PCT Decision of International Preliminary Examination;					
(d) International Publication No. WO 96/21943 (together with International Search Report).					

U.S. APPLICATION NO (if known, see 37 CFR 1.5) -----		INTERNATIONAL APPLICATION NO PCT/RU95/00063		ATTORNEY'S DOCKET NUMBER P-9701 ISK		
17. <input type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</b> Search Report has been prepared by the EPO or JPO ..... \$880.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) ..... \$680.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$750.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$1010.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$94.00  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>CALCULATIONS PTO USE ONLY</b>		
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 130.00		
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			
Total claims	1 - 20 =	0	X \$22.00	\$ -----		
Independent claims	1 - 3 =	0	X \$78.00	\$ -----		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$250.00	\$ -----		
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 1,140.00		
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$		
<b>SUBTOTAL =</b>				\$		
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$ -----		
<b>TOTAL NATIONAL FEE =</b>				\$ 1,140.00		
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$ 40.00		
<b>TOTAL FEES ENCLOSED =</b>				\$ 1,180.00		
				Amount to be: refunded	\$	
				charged	\$	
a. <input checked="" type="checkbox"/> A check in the amount of \$ 1,180.00 to cover the above fees <del>is enclosed</del> will follow.						
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.						
c. <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.						
<b>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</b>						
SEND ALL CORRESPONDENCE TO Lackenbach Siegel Marzullo Aronson & Greenspan, P.C. Lackenbach Siegel Building One Chase Road Scarsdale, NY 10583 (914) 723 4300						
				 SIGNATURE		
				Myron Greenspan NAME		
				Reg. No. 25,680 REGISTRATION NUMBER		

Applicant or Patentee: Tokmulin et al.

Docket No.: P-9701 ISK

Serial or Patent No.: 08/860,763

Filed or Issued: July 11, 1997

For: Device for Treating Planar Elements with a Plasma Jet

**DECLARATION CLAIMING SMALL ENTITY STATUS**

[37 CFR 1.9(f) and 1.27(C)]

**SMALL BUSINESS CONCERN**

I hereby declare that I am

- ☐ the owner of the small business concern identified below:  
☒ an official of the small business concern empowered to act on behalf of the concern identified below

NAME OF CONCERN: Az Corporation (Aktzionernoe obshestvo "Nauchno-proizvodstvennaya firma 'Az'")

ADDRESS OF CONCERN: 40 B. Semenovskaya St., 105023 Moscow RUSSIA.

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled: described in

- ☐ the specification filed herewith  
☒ application serial no. 08/860,763, filed July 11, 1997.  
☐ patent no. , issued

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Note: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME: Az Corporation (Zakrytoe Aktzionernoe Obschestvo "Nauchno-proizvodstvennaya firma 'Az'") ADDRESS: 40 B. Semenovskaya St., 105023, Moscow, RUSSIA	<input type="checkbox"/> INDIVIDUAL <input checked="" type="checkbox"/> SMALL BUSINESS CONCERN <input type="checkbox"/> NONPROFIT ORGANIZATION
FULL NAME: ADDRESS:	<input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> SMALL BUSINESS CONCERN <input type="checkbox"/> NONPROFIT ORGANIZATION
FULL NAME: ADDRESS:	<input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> SMALL BUSINESS CONCERN <input type="checkbox"/> NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified declaration is directed.

NAME OF PERSON SIGNING

TITLE

Vyacheslav A. ARKHANGELSKY

Director General

SIGNATURE

DATE

July 31, 1997

RESIDENCE ADDRESS

7-ya Parkovaya St., d.10, kv.18, 105043, Moscow, RUSSIA

**DEVICE FOR TREATING PLANAR ELEMENTS  
WITH A PLASMA JET**

**BACKGROUND OF THE INVENTION**

**1. Field of the Invention**

The present invention relates to the field of plasma technology and may be used in electronics and electrical engineering when treating planar elements, for example semiconductor wafers, substrates, printed circuit boards, compact disks and other products.

**2. Description of the Related Art**

There has been known a device for studying a plasma - surface interaction, comprising a plasma generator, a power source therefor, a system for the plasma generator displacement, a system for displacing samples, a gas distribution system and a control system (see, Theses of the Reports at the 10<sup>th</sup> All-Union Conference "Low-Temperature Plasma Generators", Part II, Minsk, ITMS Publishers, Academy of Sciences of Byelorussian Soviet Socialist Republic, 1986, p. 135, Kulik P. P., et al.).

This device has a number of disadvantages.

The absence of a quick-operating loading-unloading system results in high time expenditures and, hence, plasma generator energy consumable to no purpose when replacing plates-samples to be treated.

The lack of the possibility to simultaneously treat several plates-samples one after another decreases the output.

The presence in the device of a plurality of control and measuring means which are inhibitory to the performance of a repeated treatment of samples according to a rigidly prescribed cycle, unambiguously defines this device as being a purely research one.

Taken together, all the above-mentioned results in the fact that the device cannot be used under the series production conditions.

The closest prior art has been described in the International application WO 92/21220, H05H 1/40, 1992, disclosing a device for treating wafers with a plasma jet, comprising a plasma jet generator; gas supplying means; a set of holders for wafers to be treated; said holders being structurally made in the form of a turntable having a drive for effecting angular displacement thereof and facing a generator plasma jet directed downwards; each of the holders being made in the form of a horizontal platform to rotate about the axis passing through the center thereof and being perpendicular to a plane of said platform; said plasma jet and wafer holder having the possibility to be displaced with respect to each other in the direction of at least one axis of coordinates and may be in or out of contact with each other.

Main drawbacks associated with this device reside in an underproductivity limited by a large volume of manual operations when loading-unloading the wafers to be treated. In so doing, the wafers treated are inferior in quality due to a

possible damage of their surface when contact-attaching in the holder.

Moreover, the direction of a plasma jet from top to bottom necessitates the measure-taking on the provision of cooling the plasma generator from overheating with upward-coming hot gases formed during operation of the plasma generator.

### SUMMARY OF THE INVENTION

According to the present invention, there is provided a device for treating wafers with a plasma jet, comprising a plasma jet generator, gas supplying means, a set of holders for wafers to be treated. The holders have a drive for effecting angular displacement thereof and face a generator plasma jet, each of the holders being made in the form of a horizontal platform to rotate about the axis passing through geometric center thereof and being perpendicular to a plane of said platform. Said plasma jet and wafer holder have the possibility to be displaced with respect to each other in the direction of at least one axis of coordinates and they may be in or out of contact with each other. The device further comprises a manipulator, storage devices for the wafers to be treated, and a closed chamber having a gas exchange system with the wafer holders and a plasma jet generator located inside said chamber such that a plasma jet is directed from bottom upwards in respect of a plane of locating horizontal platforms of said wafer holders. The closed chamber is provided with a window in which a movable shutter is installed. The manipulator is located to contact with said storage devices directly and with said

wafer holder indirectly, through the chamber window. Each of the wafer holders is provided with a limiter at the edges and has its horizontal platform provided with at least three vortex chambers and three tangential channels being perpendicular to a plane of said horizontal platform, wherein each of said vortex chambers is provided with an open portion located on a level end surface of the wafer holder, coupled through a tangential channel to said gas supplying means and located such that vortex flows formed afford holding of the platform near the holder and cooling of its individual areas to equalize, over the wafer surface, an amount of energy used for treating thereof. Said limiters on the wafer holder platforms are fabricated as the rods mounted at an angle  $\alpha > 90^\circ$  to the plane of said horizontal platform of the wafer holder. In so doing, their length,  $l$ , is chosen such that

$$2l \sin (\alpha > 90^\circ) > \Delta$$

where  $\Delta$  denotes a maximum deviation from axisymmetric arrangement of the treated wafers in said storage devices.

The technical result of using the proposed device is attained by the following features in accordance with the present invention.

Provision of the device with a common rotary drive for the holders, said drive being mounted inside the closed chamber and having its actuating mechanism connected to each of the holders, greatly enhances output of the device.

Introduction of a manipulator with storage devices for the wafers to be treated makes it possible to further enhance the

treatment capacity at the expense of reducing a time needed for loading-unloading the wafers.

The use of a wafer holder having at least three vortex chambers and three tangential channels with the axes of said vortex chambers perpendicular to the horizontal platform of the holder, where each of said vortex chambers being coupled to the tangential channel connected to gas supplying means, allows achievement of a stable holding of the wafer to be treated in the vicinity of the holder with a gas gap without touching the wafer and the holder which, in turn, enables to upgrade the treatment quality due to the absence of the touch traces (scratches).

Arrangement of each of the vortex chambers in the holder such that vortex flows formed by said vortex chambers enable the fulfillment, at each site of the wafer surface, of the condition for  $Q_0 = Q_1 + Q_2$

where:

$Q_0$  = const - an amount of energy for heating the wafer in the given site;

$Q_1$  - an amount of energy received by the given site of the wafer surface with due regard to thermal transparency thereof;

$Q_2$  - an amount of energy available at the expense of interaction with a material of the wafer surface in the given site, makes it possible to produce more uniform, and hence, high-quality treatment of the wafer.

This is conditioned by the fact that each vortex chamber, when creating a gas vortex, makes it possible not only to hold



the wafer near the holder but also to cool individual areas of the wafer to be treated. Since in the process for treatment, different sites on the surface of the wafer to be treated are under different thermal conditions, then proceeding from an energy balance, vortex flows enable establishment of the conditions to equalize  $Q_0$  at all sites of the wafer.

The use of limiters on the holders in the form of the rods mounted at an angle  $\alpha > 90^\circ$  to the horizontal platform of the holder, with their length,  $l$ , being chosen such that

$$2l \sin(\alpha > 90^\circ) > \Delta$$

where  $\Delta$  denotes a maximum deviation from axisymmetric arrangement of the wafers in said storage devices, offers a required accuracy when loading-unloading the wafers, without using additional centering means.

### BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawings, in which:

FIG. 1 is a view showing a device for treating wafers with a plasma jet;

FIG. 2 is a view A of FIG. 1;

FIG. 3 is a functional diagram of an actuating mechanism of a common rotary drive for holders;

FIG. 4 is a view showing a wafer holder;

FIG. 5 is a sectional view A-A of FIG. 4.

## BEST MODE TO CARRY OUT THE INVENTION

Referring to FIGS. 1, 2, there is illustrated a device for treating wafers with a plasma jet, comprising a closed chamber 1; a gas exchange system 2; a power supply unit 3; gas supplying means 4, a control system 5. The closed chamber 1 is provided with a window 6 in which a movable shutter 7 with a drive 8 is installed. Inside the closed chamber 1, on a base 9, there are located a generator 10 of a plasma jet 11, an angular displacement drive 12 with its upright shaft 13 coupled to holders 14. The generator 10 of the plasma jet 11 facing the holders 14 is mounted on the base 9 on a support 15 adjustable for height such that the axis of the plasma jet 11 and respective axes of each of the holders 14 are equidistant from the axis of the upright shaft 13 of the angular displacement drive 12. Referring to FIG. 4, the holders 14 are made in the form of horizontal platforms 16 with limiters 17. Said limiters 17 are fabricated as the rods, for example cylindrical rods. With reference to FIG. 3, it is seen that the horizontal platforms 16 are set in rotation about their axes by a drive 18, for example by means of an actuating mechanism 19 through a step-by-step interaction of its gears 20, 21, 22 and pulleys 23, 24. It is illustrated in FIGS. 4 and 5 that the horizontal platforms 16 are provided with vortex chambers 25 each having an open portion located on a level end surface of the holder 14 and coupling to a tangential channel 26 connected to said gas supplying means 4. It is shown in FIG. 1 that outside the closed chamber 1, on the base 9, a

manipulator 27 and storage devices 28 for wafers 29 are mounted.

## INDUSTRIAL APPLICABILITY

The device operates as follows.

In the initial state, one of the storage devices 28 is provided with wafers 29, while the other is free from the wafers.

A manipulator 27 serves to grip a bottom wafer 29 in the storage device 28 and to transport it through a window 6 (with a shutter 7 opened by a drive 8) inwards a closed chamber 1.

At that moment, a first of the holders 14 is under loading. The manipulator 27 conveys the wafer 29 in a position below a horizontal platform 16 of the first holder 14.

By switching gas supplying means 4 in vortex chambers 25, 26 of the holder 14, gas vortex flows are generated to provide for the holding of the wafer 29 at a distance of about 0.5 - 1.0 mm from a level end surface of the platform 16 of the holder 14. At that moment, the manipulator 14 releases the wafer 29. The wafer has been loaded. Thereupon, the next wafer is loaded.

In an embodiment as illustrated here, a device for treating wafers with a plasma jet is provided with five wafer holders located at an angle of  $72^\circ$  to one another in the horizontal plane. Feeding the next holder in the loading zone is performed with an angular displacement drive 12 for the holder 14.

On loading of all the holders, the manipulator 27 is withdrawn from the closed chamber 1 while closing the shutter 7 with the drive 8. A required gas is supplied to the chamber.

By means of a support 15, a generator 10 of a plasma jet 11 is mounted, with respect to the surface of the wafer 29 to be treated, at a height suitable for a manufacturing process.

On switching the drive 18, the holders 14 start rotation, together with the wafers 29, about their axes. In so doing, a control system 5 is used to specify dynamics of the wafer movement. The generator 10 of the plasma jet 11 and the angular displacement drive 12 are switched and the treatment is carried out.

Following a prescribed number of contacts of the wafer 29 with the plasma jet 11 of the generator 10, the drive 12 is brought to a stop, under the predetermined program from the control system 5, such that none of the wafers 29 in the holders 14 falls within the zone of action of the generator plasma jet.

Then, the drive 18 and the generator 10 are turned off.

Hereinafter, the cycle is repeated using the next batch of wafers.

Various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims.

## WHAT IS CLAIMED IS:

A device for treating wafers with a plasma jet, comprising a plasma jet generator; gas supplying means; a set of holders for wafers to be treated; said holders having a drive for effecting angular displacement thereof and facing a generator plasma jet; each of the holders being made in the form of a horizontal platform to rotate about the axis passing through geometric center thereof and being perpendicular to a plane of said platform; said plasma jet and wafer holder having the possibility to be displaced with respect to each other in the direction of at least one axis of coordinates and may be in or out of contact with each other, characterized in that it additionally comprises a manipulator; storage devices for the wafers to be treated; and a closed chamber having a gas exchange system with the wafer holders and a plasma jet generator located inside said chamber such that a plasma jet is directed from bottom upwards in respect of a plane of locating horizontal platforms of said wafer holders; said closed chamber is provided with a window in which a movable shutter is mounted; said manipulator is located to contact with said storage devices directly and with said wafer holder indirectly, through the chamber window; each of the wafer holders is provided with a limiter at the edges and has its horizontal platform provided with at least three vortex chambers and three tangential channels being perpendicular to a plane of said horizontal platform; each of said vortex chambers is provided

with an open portion located on a level end surface of the wafer holder, coupled through a tangential channel to said gas supplying means and located such that vortex flows formed afford holding of the platform near the holder and cooling of its individual areas to equalize, over the wafer surface, an amount of energy used for treating thereof; said limiters on the wafer holder platforms are fabricated as the rods mounted at an angle  $\alpha > 90^\circ$  to the plane of said horizontal platform of the wafer holder, and their length,  $l$ , is chosen such that

$$2l \sin (\alpha > 90^\circ) > \Delta$$

where  $\Delta$  denotes a maximum deviation from axisymmetric arrangement of the treated wafers in said storage devices.

### ABSTRACT

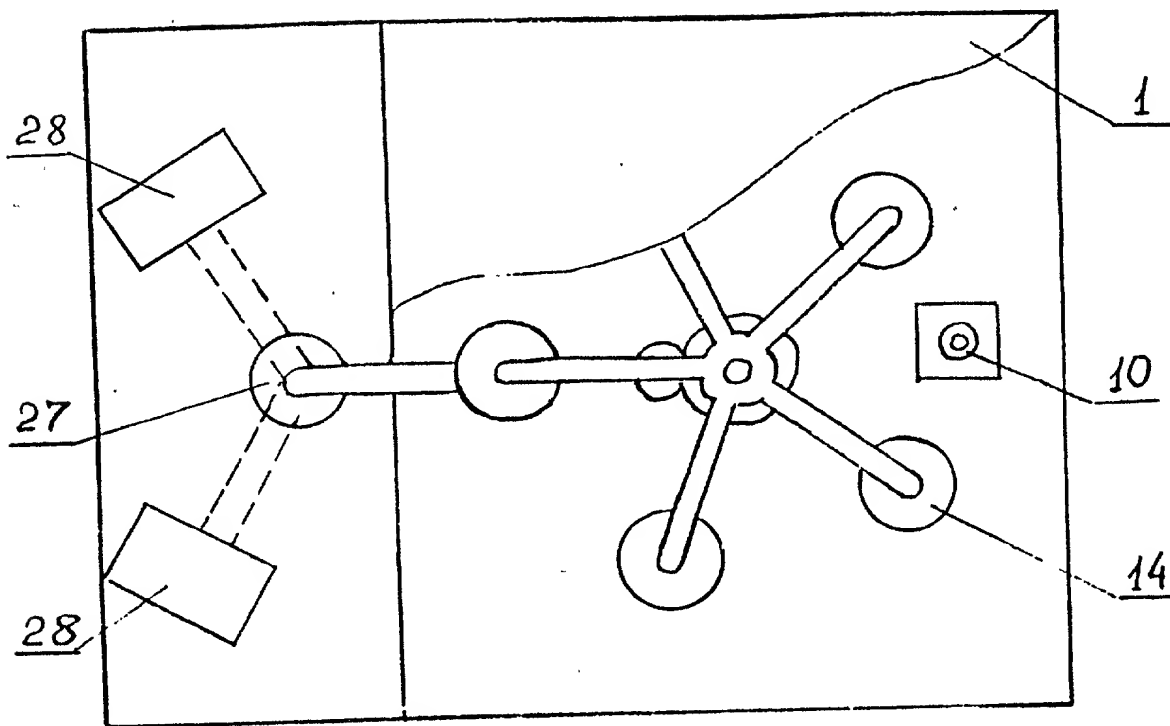
Used in the technical field of plasma treatment of planar elements such as plates, sheets and wafers in electronics and electrical engineering, the invention in essence is a device for treating wafers with a plasma jet. The device comprises the following elements mounted in a closed chamber (1): a drive (12) which effects angular displacement of the holders (14) which are provided with a common rotary drive (18); a plasma jet generator (10); and, mounted outside the closed chamber (1), a manipulator (27) and storage devices (28) for the wafers (29). The wafer (29) to be treated is picked up by the manipulator (27) from the storage device (28) and placed in the holder (14) which together with the wafer (29) passes over the plasma jet generator (10) used for the treatment. The cycle may be repeated a predetermined number of times.

**1 Claim, 5 Drawing Figures**

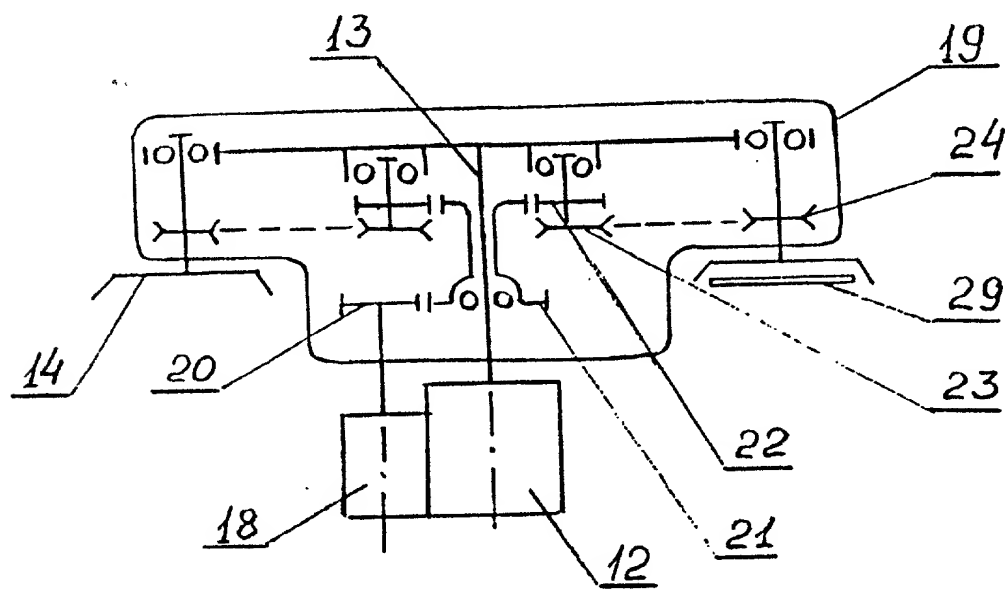




2/3

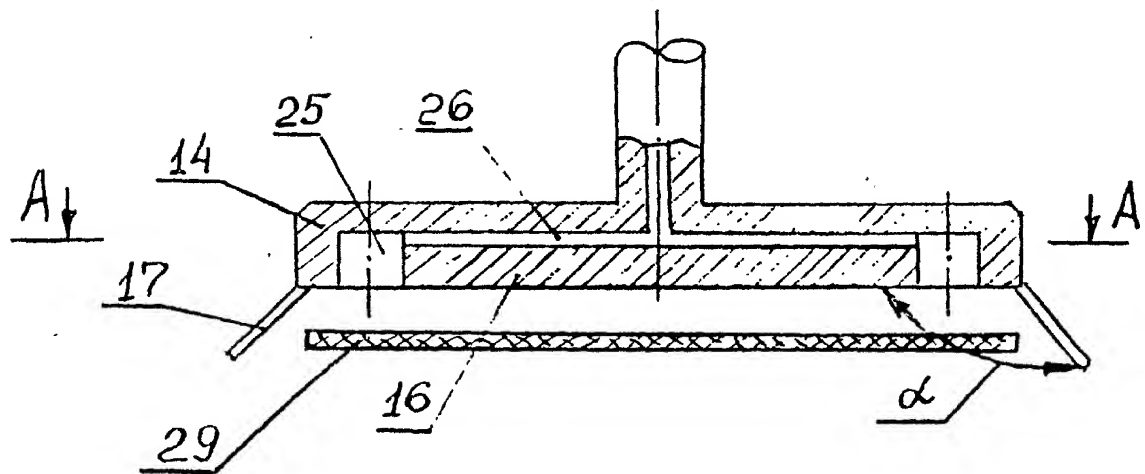


Фиг. 2

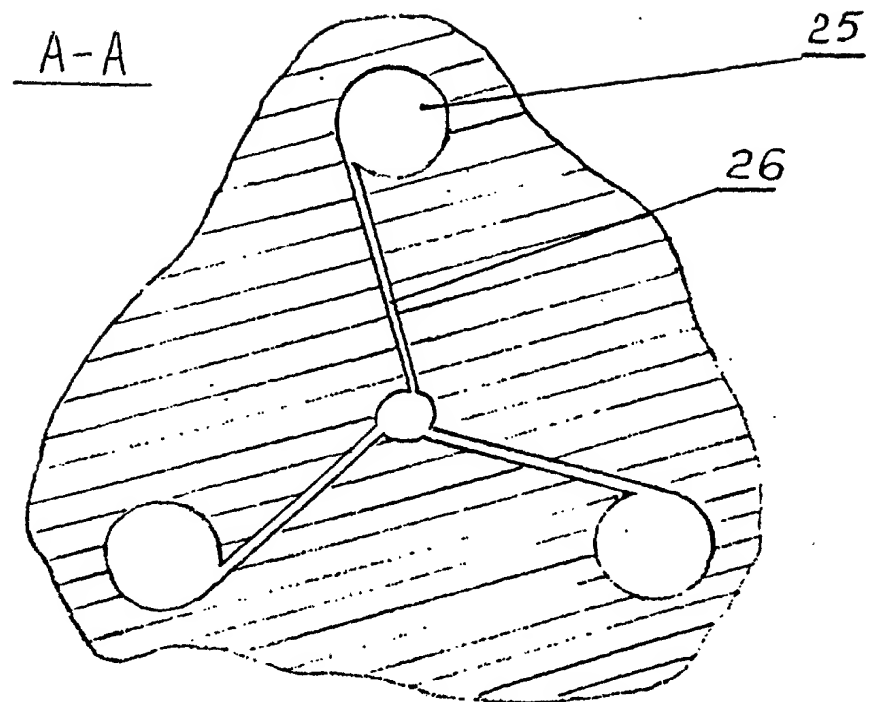


Фиг. 3

3/3



Фиг. 4



Фиг. 5

**UNITED STATES -- PATENT**  
**DECLARATION FOR PATENT APPLICATION**

Attorney's Docket No.: **P-9701 ISK**

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DEVICE FOR TREATING PLANAR ELEMENTS WITH A PLASMA JET

the specification of which

(check one) ☐ is attached hereto.

X was filed on July 11, 1997 as

Application Serial No.: 08/860,763

and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Appln. No.	Country	Date Filed	Priority Claimed
95100180	Russia	January 13, 1995	X YES <input type="checkbox"/> NO
PCT/RU95/00063	PCT	April 11, 1995	X YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Appln. Serial No.	Filing Date	Status: Patented, Pending, Abandoned
		<input type="checkbox"/> Patented <input type="checkbox"/> Pending <input type="checkbox"/> Abandoned
		<input type="checkbox"/> Patented <input type="checkbox"/> Pending <input type="checkbox"/> Abandoned
		<input type="checkbox"/> Patented <input type="checkbox"/> Pending <input type="checkbox"/> Abandoned

## POWER OF ATTORNEY

I hereby appoint the following attorney(s) and/or agent(s) to prosecute the application entitled DEVICE FOR TREATING PLANAR ELEMENTS WITH A PLASMA JET and to transact all business in the Patent and Trademark Office connected therewith:

HENRY A. MARZULLO, JR., Reg. No. 20,910; HOWARD N. ARONSON, Reg. No. 27,302; and MYRON GREENSPAN, Reg. No. 25,680.

Address all telephone calls to *Myron Greenspan*, at telephone number (914) 723-4300, or to the attorney executing the last document.

Address all correspondence to **LACKENBACH SIEGEL MARZULLO ARONSON & GREENSPAN, P.C.**  
at **Penthouse Suite, One Chase Road, Scarsdale, New York 10583 U.S.A.**


I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First or Sole Inventor <b>Iskander M. Tokmulin</b>	Citizenship <b>Russian</b>
RESIDENCE Address -- Street <b>c/o IPEC Precision, 3 Berkshire Boulevard</b>	POST OFFICE Address -- Street <b>(same as residence)</b>
City (Zip) <b>Bethel</b>	City (Zip)
State or Country <b>Connecticut 06801</b>	State or Country
Date	Signature

Full Name of Second Joint Inventor <b>Igor P. Bagriy</b>	Citizenship <b>Russian</b>
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City (Zip) <b>Bethel</b>	City (Zip)
State or Country <b>Connecticut 06801</b>	State or Country
Date	Signature

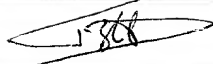
  

Full Name of Third Joint Inventor <b>Boris M. Balats</b>	Citizenship <b>Russian</b>
RESIDENCE Address -- Street <b>Ukhtomskaya St, d. 13, kv. 43</b>	POST OFFICE Address -- Street <b>(same as residence)</b>
City (Zip) <b>111020 Moscow</b>	City (Zip)
State or Country <b>RUSSIA</b>	State or Country
Date <b>11.08.97</b>	Signature 

X Additional inventors are being named on separately numbered sheets attached hereto.

Full Name of Fourth Joint Inventor Oleg V. Sinyagin	Citizenship Russian
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City (Zip)	City (Zip)
State or Country	State or Country
Date	Signature

Full Name of Fifth Joint Inventor Alexei B. Virovets	Citizenship Russian
RESIDENCE Address -- Street 144 Painter Road	POST OFFICE Address -- Street (same as residence)
City (Zip) Southbury	City (Zip)
State or Country Connecticut 06488	State or Country
Date	Signature

Full Name of Sixth Joint Inventor Vyacheslav G. Shamshurin	Citizenship Russian
RESIDENCE Address -- Street Krasnopolyanskaya St., d. 35, kv. 124	POST OFFICE Address -- Street (same as residence)
City (Zip) 141730 Moskovskaya oblast', Lobnya	City (Zip)
State or Country RUSSIA	State or Country
Date 11.08.97	Signature 

Full Name of Seventh Joint Inventor Aleksandr M. Antropov	Citizenship Russian
RESIDENCE Address -- Street	POST OFFICE Address -- Street (same as residence)
City (Zip)	City (Zip)
State or Country	State or Country
Date	Signature

**UNITED STATES -- PATENT**  
**DECLARATION FOR PATENT APPLICATION**

Attorney's Docket No.: **P-9701 ISK**

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DEVICE FOR TREATING PLANAR ELEMENTS WITH A PLASMA JET

the specification of which

(check one) ☐ is attached hereto.

X was filed on July 11, 1997 as  
Application Serial No.: 08/860,763,  
and was amended on \_\_\_\_\_  
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Appln. No.	Country	Date Filed	Priority Claimed
95100180	Russia	January 13, 1995	X YES <input type="checkbox"/> NO
PCT/RU95/00063	PCT	April 11, 1995	X YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Appln. Serial No.	Filing Date	Status: Patented, Pending, Abandoned
		<input type="checkbox"/> Patented <input type="checkbox"/> Pending <input type="checkbox"/> Abandoned
		<input type="checkbox"/> Patented <input type="checkbox"/> Pending <input type="checkbox"/> Abandoned
		<input type="checkbox"/> Patented <input type="checkbox"/> Pending <input type="checkbox"/> Abandoned

# POWER OF ATTORNEY

I hereby appoint the following attorney(s) and/or agent(s) to prosecute the application entitled DEVICE FOR TREATING PLANAR ELEMENTS WITH A PLASMA JET and to transact all business in the Patent and Trademark Office connected therewith:

3 HENRY A. MARZULLO, JR., Reg. No. 20,910; HOWARD N. ARONSON, Reg. No. 27,302; and MYRON GREENSPAN, Reg. No. 25,680.

Address all telephone calls to *Myron Greenspan*, at telephone number (914) 723-4300, or to the attorney executing the last document.

Address all correspondence to LACKENBACH SIEGEL MARZULLO ARONSON & GREENSPAN, P.C.  
at Penthouse Suite, One Chase Road, Scarsdale, New York 10583 U.S.A.


I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First or Sole Inventor <b>Iskander M. Tokmulin</b>	Citizenship <b>Russian</b>
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Date <b>09/02/97</b>	Signature <i>[Signature]</i> <b>I. TOKMULINE</b>
Full Name of Second Joint Inventor <b>Igor P. Bagriy</b>	Citizenship <b>Russian</b>
RESIDENCE Address -- Street c/o IPEC Precision, 3 <b>Berkshire Boulevard</b>	POST OFFICE Address -- Street (same as residence)
City (Zip) <b>Bethel</b>	City (Zip)
State or Country <b>Connecticut 06801</b>	State or Country
Date <b>09/03/97</b>	Signature <i>[Signature]</i>
Full Name of Third Joint Inventor <b>Boris M. Balats</b>	Citizenship <b>Russian</b>
RESIDENCE Address -- Street <b>Ukhtomskaya St., d. 13, kv. 43</b>	POST OFFICE Address -- Street (same as residence)
City (Zip) <b>111020 Moscow</b>	City (Zip)
State or Country <b>RUSSIA</b>	State or Country
Date	Signature

340 X Additional inventors are being named on separately numbered sheets attached hereto.

Full Name of Fourth Joint Inventor <u>Oleg V. Sinyagin</u>	Citizenship Russian
RESIDENCE Address -- Street	POST OFFICE Address -- Street (same as residence)
City (Zip)	City (Zip)
State or Country	State or Country
Date	Signature

Full Name of Fifth Joint Inventor <u>Alexei B. Virevets</u>	Citizenship Russian
RESIDENCE Address -- Street <u>144 Painter Road</u>	POST OFFICE Address -- Street (same as residence)
City (Zip) <u>Southbury</u>	City (Zip)
State or Country <u>Connecticut 06488</u>	State or Country
Date <u>09/02/97</u>	Signature 

Full Name of Sixth Joint Inventor <u>Vyacheslav G. Shamshurin</u>	Citizenship Russian
RESIDENCE Address -- Street <u>Krasnopolyanskaya St., d. 35, kv. 124</u>	POST OFFICE Address -- Street (same as residence)
City (Zip) <u>141730 Moskovskaya oblast', Lobnya</u>	City (Zip)
State or Country <u>RUSSIA</u>	State or Country
Date	Signature

Full Name of Seventh Joint Inventor <u>Aleksandr M. Antropov</u>	Citizenship Russian
RESIDENCE Address -- Street	POST OFFICE Address -- Street (same as residence)
City (Zip)	City (Zip)
State or Country	State or Country
Date	Signature



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**Applicant(s): **TRIMULIN ET AL.**Assignee: **AZ CORPORATION**Title: **DEVICE FOR TREATING PLANAR ELEMENTS WITH  
A PLASMA JET**Serial No.: **08/860,763**Filed: **JULY 11, 1997**

Examiner:

Group Art Unit:

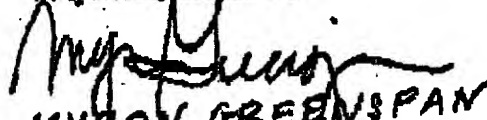
Design No.: **P-97011SK****ASSISTANT COMMISSIONER FOR PATENTS  
Washington, D. C. 20231****POWER TO INSPECT AND MAKE COPIES**

Dear Sir:

This communication authorizes and grants Terry Karmosky or her associate of TK, Associates, 2001 Jefferson Davis Highway, Suite 300, Arlington, Virginia 22202, the power to inspect the subject patent application and to make copies of any documents contained therein.

Any questions concerning this Power to inspect should be directed to the undersigned attorney for applicant(s) at the number below.

Respectfully submitted,

  
**MYRON GREENSPAN**  
Attorney for Applicant(s)  
Reg. No. 25,680  
Tel. No. 914-723-4300  
Fax No. 914-723-4301